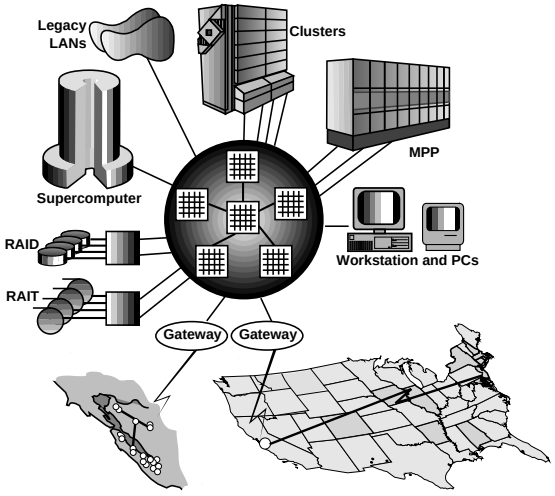
Gigabit Networking

Eliminating communication bottlenecks

The ability of scientists and engineers to effectively use the computing, storage, and visualization capabilities of high-performance systems is limited by the performance of current network technologies. The advent of massively parallel processors (MPPs), cluster computing, striped storage systems, and powerful workstation technologies requires the application of very-high-speed switched networks. LLNL's Advanced Telecommunication Program (ATP) has R&D projects whose goals are to provide Gb/s link speeds and much higher aggregate data rates between on-site systems and off-site systems over metropolitan- and wide-area networks (MANs and WANs). We are building upon emerging Fibre Channel (FC), Asynchronous Transfer Mode (ATM), and optical networking technologies.



Gigabit switched networks will connect our personnel and facilities to collaborators throughout the San Francisco Bay Area and the United States.

Fibre channel projects

We have established an interoperability testing facility for FC equipment and are working with vendors to test and evaluate early prerelease/prototype systems. We have industrial agreements with IBM, HP, Sun, and other companies. We are also active in the ANSI X3T11 standards committee and the FC Association to influence the standards to meet our high-end requirements and to resolve issues identified in our interoperability testbed.

APPLICATIONS

- *Fast file transfer*
- *Visualization of high-resolution color movies*
- *Telecollaboration*
- *Distributed computing*
- *Disk and tape I/O*

Since peripheral I/O is a bottleneck on many MPP systems, FC technology is being applied in LLNL's Scalable I/O Facility, which will demonstrate a high-performance, scalable, and cost-effective approach to disk and tape I/O.

ATM projects

We work with 14 other institutions in the Bay Area Gigabit Network (BAGNet) testbed, which is applying early ATM technologies toward high-bandwidth applications, including teleseminars and remote storage access.

We are also a member of the AT&T XUNET testbed WAN, which connects collaborating universities and research laboratories across the U.S. We are implementing a FC-to-ATM router, which will provide connectivity from FC- attached devices to ATM WANs.

Optical networking projects

The application of wavelength division multiplexing (WDM) and optical switching devices will support the transmission of multiple channels on a single fiber. This will allow cost-effective protocol independent WANs to be built in the future. We have implemented a WDM link from LLNL to UC Berkeley over 100 km of standard telco fiber. We are also working with an ARPA-funded consortium to integrate an optical testbed network in the Bay Area supporting optical switching of multiple 2.5 Gb/s WDM channels.

Availability: Collaboration with industry and other organizations is key to our success. Therefore, we are soliciting industrial partners on these and other innovative projects.

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